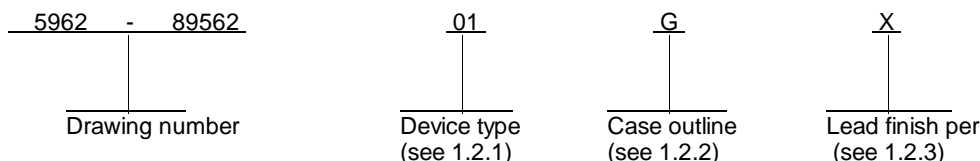


1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part or Identifying Number (PIN). The complete PIN shall be as shown in the following example:



1.2.1 Device type(s). The device type(s) shall identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	LT1054M	Switched capacitor voltage converter with regulator

1.2.2 Case outline(s). The case outline(s) shall be as designated in MIL-STD-1835, and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
G	MACY1-X8	8	TO-257 can with isolated tab
P	GDIP1-T8 or CDIP2-T8	8	Dual-in-line
X	See figure 1	8	Can

1.2.5 Lead finish. The lead finish shall be as specified in MIL-M-38510. Finish letter "X" shall not be marked on the microcircuit or its packaging. The "X" designation is for use in specifications when lead finishes A, B, and C are considered acceptable and interchangeable without preference.

1.3 Absolute maximum ratings.

Supply voltage range (V+)	16 V dc 1/
Input voltage range (pin 1)	$0 \text{ V dc} \leq V_{\text{PIN1}} \leq V_{+}$
Input voltage range (pin 7)	$0 \text{ V dc} \leq V_{\text{PIN7}} \leq V_{\text{REF}}$
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-STD-1835
Thermal resistance, junction-to-ambient (θ_{JA}):	
Case G	150°C/W
Case P	100°C/W
Junction temperature (T_{J})	+150°C

1.4 Recommended operating conditions.

Supply voltage range	3.5 V dc to 15 V dc
Ambient operating temperature range (T_{A})	-55°C to +125°C

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, bulletin, and bulletin. Unless otherwise specified, the following specifications, standards, and bulletin of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATIONS MILITARY

MIL-M-38535 - Integrated Circuits (Microcircuits) Manufacturing, General Specification for.

1/ Rating is for regulated circuits. For regulation mode circuits with $V_{\text{OUT}} \leq 15 \text{ V}$ at V_{OUT} pin, this rating may be increased to 20 V dc.

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STANDARDS
MILITARY

- MIL-STD-883 - Test Methods and Procedures for Microelectronics.
- MIL-STD-1835 - Microcircuit Case Outlines.

BULLETIN
MILITARY

- MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

(Copies of the specifications, standards, and bulletin required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein. Product built to this drawing that is produced by a Qualified Manufacturer Listing (QML) certified and qualified manufacturer or a manufacturer who has been granted transitional certification to MIL-I-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-I-38535. This QML flow as documented in the Quality Management (QM) plan may make modifications to the requirements herein. These modifications shall not affect form, fit, or function of the device. These modifications shall not affect the PIN as described herein. A "Q" or "QML" certification mark in accordance with MIL-I-38535 is required to identify when the QML flow option is used.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-STD-883 (see 3.1 herein) and herein.

3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full ambient operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are defined in table I.

3.5 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked as listed in MIL-BUL-103 (see 6.6 herein).

3.6 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-EC prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DESC-EC shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.9 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C unless otherwise specified		Group A subgroups	Limits <u>2/</u>		Unit
					Min	Max	
Supply current	I _{CC}	I _{LOAD} = 0 mA	V _{IN} = 3.5 V V _{IN} = 15 V	1, 2, 3		4 5	mA
Voltage loss <u>1/</u>	V _{IN} - V _{OUT}	C _{IN} = C _{OUT} = 100 μF tantalum	I _{OUT} = 10 mA	1, 2, 3		0.55	V
			I _{OUT} = 10 mA	1, 2, 3		1.60	
Output resistance <u>2/ 3/</u>	R _{OUT}	ΔI _{OUT} = 10 mA to 100 mA		4, 5, 6		15	Ω
Oscillator frequency	f _{OSC}	3.5 V ≤ V _{IN} ≤ 15 V		4, 5, 6	15	35	kHz
Reference voltage	V _{REF}	I _{REF} = 60 μA		1	2.35	2.65	V
				2, 3	2.25	2.75	
Regulated voltage <u>2/ 4/</u>	V _{REG}	V _{IN} = 7.0 V		1, 2, 3	-4.70	-5.20	V
Line regulation <u>4/</u>	V _{RLINE}	7.0 V ≤ V _{IN} ≤ 12 V		1, 2, 3		25	mV
Load regulation <u>4/</u>	V _{RLOAD}	V _{IN} = 7.0 V, 50Ω ≤ R _L ≤ 100Ω		1, 2, 3		50	mV
Supply current in shutdown	I _{SHDN}	V _{PIN1} = 0V		1, 2, 3		200	μA

1/ The voltage loss tests are done on a dc basis. The voltage loss is measured for each individual switch then summed to get the total voltage loss. Each switch is tested at two current levels. The switch current levels are chosen to correlate to a device operating as a voltage inverter, with pins 1, 6, and 7 unconnected. To simulate the loss of a running device at 10 mA load, the switches are loaded with 24 mA. To simulate a device running at 100 mA load, the switches are loaded with 240 mA. Switches are turned on in pairs, but the voltage loss is measured across each switch of the pair.

2/ If not tested, subgroups 2, 3, 5, and 6 shall be guaranteed to the limits specified in table I.

3/ Output resistance is defined as the slope of the curve, (ΔV_{OUT} vs ΔI_{OUT}), for output currents of 10 mA to 100 mA. This represents the linear portion of the curve. The incremental slope of the curve will be higher at currents < 10 mA due to the characteristics of the switch transistors.

4/ All regulation specifications are for a device connected as a positive to negative converter/regulator with R₁ = 20kΩ, R₂ = 102.5kΩ, C₁ = 0.05 μF, C_{IN} = 10 μF tantalum, and C_{OUT} = 100 μF tantalum. Regulation tests are actually done using an RC network that simulates the large (10 μF, 100 μF) capacitors and correlated to the above circuit. Line and load regulation cannot be directly tested in production. These parameters are guaranteed by measuring the bias current at pin 1 and the dc gain from pin 1 to pin 2. Limits are correlated by bench testing to establish the required correlation factor between the two test methods.

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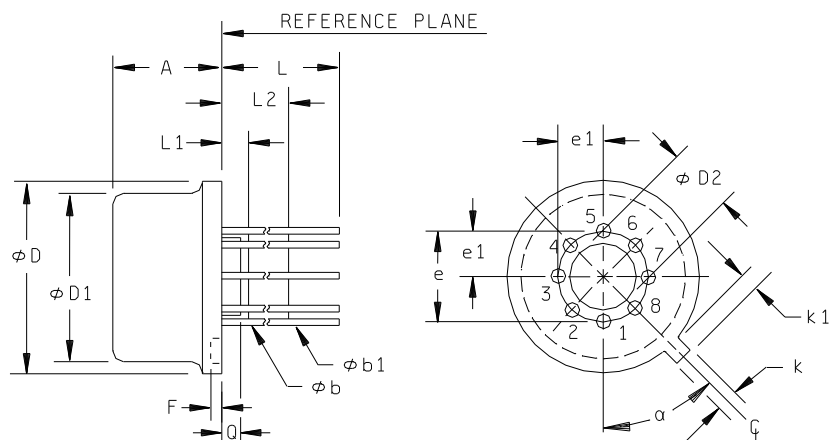
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Case outline X



Symbol	Inches		Millimeters		Notes
	Min	Max	Min	Max	
A	.165	.185	4.19	4.70	6
ϕb	.016	.019	0.41	0.48	
$\phi b1$.335	.021	0.41	0.53	7
ϕD	.305	.375	8.51	9.40	
$\phi D1$.305	.335	7.75	8.51	
$\phi D2$.110	.160	2.79	4.06	
e	.230 BSC		5.84 BSC		4
e1	.100 BSC		2.54 BSC		4
F	---	.040	---	1.02	3
k	.027	.034	0.69	0.86	
k1	.027	.045	0.69	1.14	
L	.500	.075	12.70	19.05	
L1	---	.050	---	1.27	
L2	.250	---	6.35	---	
Q	.010	.045	0.25	1.14	7
α	45° C BSC		45° C BSC		4

NOTES:

1. Dimensions are in inches.
2. The US government preferred system of measurement is the metric SI system. However, this item was originally designed using inch-pound units of measurement. In the event of conflict between the metric and inch-pound units the inch-pound units shall take precedence.
3. Measured from the maximum diameter of the product.
4. Leads having a maximum diameter .019 (0.48 mm) measured .054 (1.37 mm) + .091 (2.31 mm) - .000 (0.00 mm) below the base plane of the product shall be within .007 (0.18 mm) of their true position relative to a maximum width tab.
5. The product may be measured by direct methods or by guage.
6. All leads: Increase maximum limit by .003 inch (0.08 mm) when lead finish A is applied.
7. Optional base and seating plane.

FIGURE 1. Case outline.

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Device type	01
Case outlines	G, P, and X
Terminal number	Terminal symbol
1	FB/SD
2	CAP+
3	GND
4	CAP-
5	V _{OUT}
6	V _{REF}
7	OSC
8	v+

FIGURE 2. Terminal connections .

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-STD-883 (see 3.1 herein).

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1015 of MIL-STD-883.

(2) $T_A = +125^\circ\text{C}$, minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 7, 8, 9, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (in accordance with 5005, table I)
Interim electrical parameters (method 5004)	- - -
Final electrical test parameters (method 5004)	1*, 2, 3, 4
Group A test requirements (method 5004)	1, 2, 3, 4, 5, 6
Group C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroups 1.

4.3.2 Groups C and D inspections.

- a. End-point electrical parameters shall be as specified in table II herein.
- b. Steady-state life test conditions, method 1005 of MIL-STD-883.
 - (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in test method 1005 of MIL-STD-883.
 - (2) $T_A = +125^\circ\text{C}$, minimum.
 - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-STD-883 (see 3.1 herein).

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-973 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-EC, telephone (513) 296-6047.

6.5 Comments. Comments on this drawing should be directed to DESC-EC, Dayton, Ohio 45444-5270, or telephone (513) 296-5377.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-EC.

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STANDARDIZED MILITARY DRAWING SOURCE APPROVAL BULLETIN

DATE : 94-03-07

Approved sources of supply for SMD 5962-89562 are listed below for immediate acquisition only and shall be added to MIL-BUL-103 during the next revision. MIL-BUL-103 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DESC-EC. This bulletin is superseded by the next dated revision of MIL-BUL-103.

Standardized military drawing PIN	Vendor CAGE number	Vendor similar PIN <u>1/</u>
5962-8956201GX	<u>2/</u>	LT1054MH/883
5962-8956201PX	64155	LT1054MJ8/883
5962-8956201XX	64155	LT1054MH/883

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE
number

64155

Vendor name
and address

Linear Technology Corporation
1630 McCarthy Boulevard
Milpitas, CA 95035-7487

The information contained herein is disseminated for convenience only and the Government assumes no liability whatsoever for any inaccuracies in this information bulletin.